

MANY-BODY PHYSICS ON THE BORDER OF NUCLEAR STABILITY*

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New experimental studies reignited the theoretical interest to a broad range of phenomena on the interface of nuclear structure and nuclear reaction physics. The novel properties emerge from the interplay in the proximity of the continuum between single-particle motion, possibly of a halo type and with open nucleon decay channels, and many-body collective modes, such as pairing correlations, shape vibrations and deformations. The talk will concentrate on some of the latest theoretical methods developed for studying these problems, including the exact solution for the pairing interaction, many-body correlations beyond pairing, consistent consideration of bound states, continuum, and isotope chains. Using as an example semi-magic neutron rich nuclei with a closed proton core, specifically chains of oxygen and tin isotopes, we discuss the application of the traditional shell model, treatment of neutron pairing, extension to the continuum shell model, and related aspects of the reactions.

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